

CONTACTOR SUBMITTAL					Date 2/22/11	
PROJECT NAME: <b>San Jacinto Waste Pits</b>						
CONTRACTOR:	<b>USA Environment LP</b>		Subcontract No.		Sub.No	<b>16</b>
To:	<b>John LaPlante</b>	References:	RAWP			
		Drawing/Spec:				
Subject:	<b>Construction Quality Control Plan</b>	Detail/Section:				
		Discipline:				
Response Requested By:			High Priority:	<input checked="" type="checkbox"/>	Low Priority:	<input type="checkbox"/>
Potential Impact:		<b>TCRA</b>	Cost:	<input type="checkbox"/>	Schedule:	<input checked="" type="checkbox"/>
Attached is the final CQC for review and approval with revisions requested.						
Routing:		Date Sent	Date Received	COMMENTS		
		2/22/11				
Reply:						
Addressee: Sign and return original to:		<input checked="" type="checkbox"/> Confirms to design concept <input type="checkbox"/> Confirms to design concept with revisions shown <input type="checkbox"/> Revise and resubmit <input type="checkbox"/> For information only				
		Approved By: _____				
		Name: _____				
		Title: _____				
Cesar Garcia		Date: _____				

This submittal has been reviewed for general conformance to design concept only. This review does not relieve the contractor or supplier of full responsibility for adhering to the contract document and satisfactory completion of all work.

By:  Date: 02-23-2011  
Anchor QEA, LLC

**Final Draft**

**Construction Quality Control Plan**

**For:**

**San Jacinto River Waste Pits**

**Channelview, Harris County, Texas**



**10234 Lucore Street  
Houston, Texas 77017  
(713) 425-6900**

**CQC Preparation Date:**

**February, 2011**

***Estimated Project Dates:***

**Start of Construction: February, 2011  
Completion of Construction: August, 2011**

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## 1.0 INTRODUCTION

This Construction Quality Control Plan (CQC) has been prepared for The San Jacinto Waste Pits Superfund Site (Site) in Channelview, Harris County, Texas. The plan has been prepared in accordance with the "Final Removal Action Work Plan Time Critical Removal Action San Jacinto Waste Pits Superfund Site" (RAWP), dated November, 2010.

### ***1.1 Project Background***

The San Jacinto Waste Pits Site is located in Channelview, Texas at the northwest intersection of Interstate Highway 10 East and the San Jacinto River, in Harris County, Texas. This area was previously used for disposal of paper waste. A Site location map is presented in Figure 1 and a Site map is shown in Figure 2.

The Time Critical Removal Action (TCRA) is being implemented by International Paper Company and McGinnes Industrial Maintenance Corporation under an Administrative Order of Consent (AOC) with the United States Environmental Protection Agency (USEPA) - Docket No. 06-12-10, April 2010 (USEPA 2010a).

### ***1.2 Purpose and Scope of Construction Quality Control Plan***

The purpose of this CQC is to define procedures that will be followed at the Site to ensure that construction materials and practices used during the TCRA meet the project specifications and the requirements of the AOC. The CQC will specify roles and qualifications for personnel responsible for implementing the CQC, observations, inspections, and tests that are required to ensure that the final constructed remedy meets the specifications, and quantitative criteria against which tests and observations performed prior to and during construction are to be compared.

### ***1.3 Quality Assurance and Quality Control – Definitions***

According to the EPA, Construction Quality Assurance (CQA) is “a planned series of observations and tests to ensure that the final product meets project specifications” (EPA, 1992). In the context of this project, the CQA will be used to ensure that the soil and in-water remedies discussed in the RAWP are implemented and that the final action meets the requirements of the AOC.

Construction Quality Control (CQC) is a tool used during construction activities to measure and control the characteristics of construction materials to ensure that they meet project specifications. Where CQA is typically independent verification of construction activities to ensure compliance with regulatory and engineering requirements, CQC is written and performed by the Contractor to ensure compliance with project specifications.

## **2.0 PERSONNEL ROLES, RESPONSIBILITIES, AND QUALIFICATIONS**

The following sections describe the personnel who will be responsible for implementing the CQC and the qualifications necessary for these personnel. Additional organizations and personnel have been identified in Appendix G of the RAWP. These additional organizations and personnel are predominately associated with the oversight and Quality Assurance functions maintained by the USEPA and the Owner.

### ***2.1 Owner and Engineer***

For the purposes of this plan, the Owner is International Paper Company (IP) and McGinnes Industrial Maintenance Corporation (MIMC). The Engineer (Anchor QEA, LLC) is the Owner's designated representative. The Engineer will be responsible for observing USA operations and reviewing the USA work plans, and shall act as liaison between USA and the Owner. The Engineer has prepared the Project Construction Drawings and Specifications. The Engineer will be responsible for implementing the Quality Assurance functions described in Appendix G of the RAWP. The Construction Quality Control (CQC) Officer (USA), as defined below, will be the representative for USA.

### ***2.2 Construction Quality Control Officer***

The CQC Officer has overall responsibility for ensuring that the CQC program, as described in this plan, is implemented during all phases of the project. The CQC Officer will be knowledgeable of the details of the TCRA, as described in the RAWP, including the Specifications, and Project Construction Drawings (AnchorQEA, 2010).

The CQC Officer will relate problems or discrepancies with constructed elements to the Engineer and the Owner and will aid in evaluating these discrepancies to determine impact to the final remedy. The CQC Officer will also evaluate the results of all testing and inspection reports and compare these results to the standards specified in this plan, the plans and specifications, the Consent Decree, and any other applicable regulations. Finally, the CQC Officer will be responsible for communicating problems or items that need to be corrected to the Engineer, the Resident Project Representative (RPR), and other field personnel.

### ***2.3 Resident Project Representative (Inspector)***

The RPR (AnchorQEA) has the responsibility of on-site implementation of the CQA program as described in their CQAPP. The RPR will have experience in construction oversight. The RPR or an individual reporting to the RPR will be required to review field tests and inspections of constructed facilities and equipment in accordance with this plan. The RPR should be familiar with the testing methods described in this and other design plans. The RPR will be present on-site during the entire construction process and will document significant activities that occur during construction for review and evaluation by the Engineer. The RPR will observe contractors and surveyors in the performance of construction activities and evaluate whether project goals are met in accordance with remedy plans and specifications.

### ***2.4 Testing Laboratories***

All testing laboratories will be pre-approved by the Owner and Engineer. All laboratories will be required to meet standard quality assurance/quality control (QA/QC) procedures and to meet applicable detection and/or testing limits, as outlined below.

#### **2.4.1 Analytical Laboratory**

Samples collected during the acquisition of imported fill materials will be sent to an approved analytical laboratory, as described in the QAPP (Integral and Anchor QEA, 2010). All soil samples will be shipped under proper chain-of-custody procedures.

#### **2.4.2 Geosynthetics Laboratory**

The geosynthetics testing laboratory will analyze samples received from USA as described in the Specifications and Drawings (AnchorQEA, 2010). The CQC or his representative will be responsible for collecting samples in accordance with ASTM method requirements and shipping samples under chain-of-custody procedures described in the QAPP. The geosynthetic testing laboratory will be certified by the American Association of State Highway and Transportation Officials (AASHTO) Program.

## **2.5 Construction Contractors**

USA and any of their subcontractors utilized for the soil TCRA and for the in-water TCRA shall have the experience required to perform the activities described in the RAWP (AnchorQEA, 2010). All contractors and subcontractors shall be licensed.

## **2.6 Licensed Surveyors**

USA will provide a Texas registered survey crew to conduct the preliminary, intermediate (cross-sections) and final site survey for the San Jacinto Waste Pits Superfund Site. Survey events will be conducted for land side and water side activities. All survey activity will be performed using RTK GPS methods. Accuracy for this survey method will be maintained at +/- 0.1 feet in both the horizontal and vertical dimensions. All survey results will be measured from the site bechmarks provided by the engineers. Additionally, GPS units mounted upon excavators will be utilized to gather elevation and grid point data as armor material is placed during the project. Calibration for the vehicle mounted GPS units will be performed on a minimum weekly basis using a mobile data unit that is calibrated to know survey points and then the instruments on the equipment is calibrated against this mobile unit. The data gathered by the GPS units will be uploaded on a daily basis in a text file format to the USA Surveyor. The Surveyor will produce a cross-section every two days for review by AnchorQEA (Site Engineer).

### **2.6.1 Land Side Operations**

Land side operations include those site areas defined as shallower than three feet water depth (above water). The Surveyor will acquire the existing topographic surveys from the site Engineer and create a baseline topographic survey for the project. During mobilization activities, The Surveyor will survey the TXDOT Right of Way, proposed Laydown Area and proposed truck Turnaround Area adjacent to the TXDOT ROW. Once the clearing and grubbing operations are completed, the surveyor will establish a topographical survey of the western cell. Before geotextile and armoring materials are placed, the Surveyor will establish corner points for the varying armor cap materials. As liner and armoring material is installed, the Surveyor shall develop cross-sections for review by the Site Engineer every two days. The data will be derived from interim survey events and the text file data from the excavator mounted GPS units. Once the required elevations are achieved, a final topographic survey will be completed by the surveyor.

### **2.6.2 Water Side Operations**



Water side operations are defined as deeper than three-feet of water depth (approximately -2 NAVD 88). USA's surveyor will coordinate with AnchorQEA (and their surveyors) to develop an overall topographic survey for the water side areas of the project. USA surveyor's will establish corner points for placement of geotextile and Armor Capping materials as required per the plans and specifications. As geotextile and armoring material is installed, the Surveyor shall develop cross-sections for review by the Site Engineer every two days. The data will be derived from interim survey events and the text file data from the excavator mounted GPS units where used. Once the required elevations are achieved, a final topographic survey will be completed by the surveyor.

### 3.0 PRE-CONSTRUCTION ACTIVITIES

USA has submitted a Contractor Work Plan. This CQC plan and the Contractor's Health and Safety Plan (CHASP) are to be included with that CWP. The purpose of the USA CQC Plan is to describe in detail the personnel, equipment, and procedures that will be used to complete the project, as well as the specific tests and procedures that will be performed to ensure constructed items are completed in accordance with the design plans and specifications. The purpose of the USA HASP is to ensure all work is performed by authorized personnel in a manner consistent with all applicable Occupational Safety and Health Administration (OSHA) regulations. Contractors will also be required to attend a pre-construction meeting before each phase of construction. The purpose of this meeting is to review all aspects of the construction phase and to ensure that all parties have reviewed and understand the USA CQC Plan.

#### ***3.1 Pre-Construction Submittal***

As stated above, USA is required to submit a Contractor CQC Plan for review by the Owner and Engineer prior to the commencement of construction activities. This plan includes:

- A detailed description of all CQC elements;
- Identification of the fabricators of design components and subcontractors selected for installation;
- Input from selected subcontractors, if any; and
- Any modifications to the installation plan.

#### ***3.2 Pre-Construction Meeting***

- The Engineer, CQC Officer, RPR, and USA will attend a pre-construction meeting prior to the start of each phase of construction. The minutes of these meetings will be documented by the CQC and maintained in accordance to the Data Management Plan (AnchorQEA, 2010). The purpose of these meetings is to identify potential problems or sources of delays during construction, ensure that the Contractors have properly interpreted the intent of the design, and ensure that all parties understand and accept the rules regarding testing and corrective actions.

## 4.0 GENERAL CONSTRUCTION OBSERVATION AND DOCUMENTATION

During construction of the TCRA, quality control (QC) tests and inspections will be performed and need to be documented as part of the final construction submittal. The following sections describe the required construction observations and supporting documentation.

### ***4.1 Progress Meetings***

USA will schedule a weekly progress meeting to be held with the Owner and/or Engineer. The purpose of this meeting is to ensure that the Owner/Engineer, and Contractor(s) are all aware of the progress of work as well as any changes, delays or problems encountered during construction. At minimum, the following items will be covered at each meeting:

- Review the work activity since the last progress meeting;
- Discuss the Contractor's personnel and equipment assignments;
- Review and update the project work schedule;
- Review of CQC testing; and
- Review of documentation.

### ***4.2 Daily Quality Control Reports***

The CQC Officer with assistance from RPR will prepare a daily summary report for each day of activity. This daily report shall include, at minimum:

- Day and date of report;
- Project name, location, and list of Contractors Quality Control personnel on-site;
- Daily weather (temperature, humidity, wind speed and direction, cloud cover, and precipitation) and lost time report;
- List of Contractor personnel, equipment, and any materials that are delivered to the Site (and disposition of delivered materials);
- Description of all work performed during the day;
- Deviations from established procedures;
- Documentation of QC samples taken including time of sample, location, sample type, required tests, and sample chain-of-custody;
- Problem or deficiency correction;
- Summary of any meetings including attendees and affiliation; and
- Records of calibrations, recalibrations, or standardizations performed on field-testing equipment.

The CQC Officer must certify the daily report at the end of each working day.

### ***4.3 Daily Construction Quality Control Reports***

USA is responsible for following and documenting the quality control procedures as defined in the Contractor Quality Control Plan. The CQC is responsible for submitting a daily CQC report to the RPR every day work is performed at the Site.

### ***4.4 Problem or Deficiency Correction***

Problems with constructed elements or deficiencies that have been identified either through contractor QC or QA testing shall be documented in the daily CQC report. Any description of problems or deficiencies in the daily report must clearly reference sample results, reports, photographs, or forms that contain data or observations that lead to the determination of a problem or deficiency. Any problems or deficiency reports should include:

- A description of the problem or deficiency, including reference to supplemental data or observations that lead to the determination of the problem or deficiency;
- The location of the problem or deficiency;
- How and when the problem or deficiency was discovered;
- An estimate of how long the problem or deficiency has existed;
- An opinion as to what caused the problem or deficiency;
- An assessment of impact on the project schedule;
- Recommendations for corrective action(s) for resolving the problem or deficiency if the problem or deficiency has not been corrected; and
- A summary of observations and documentation of corrective action(s) if the problem or deficiency has been corrected.

Any problems or deficiencies that are discovered should be described on the daily summary sheet. If the problem or deficiency is corrected on the same day it is discovered, then the daily CQC report should include a description of the corrective action(s) and supporting documentation. If the problem or deficiency cannot be corrected on the same day, then the daily CQC report should state the problem or deficiency is unresolved and list actions being taken or planned to correct the deficiency. Subsequent daily CQC reports should indicate the status of all problems or deficiencies until they are resolved.

The RPR is responsible for working with the Owner and USA to determine if a problem or deficiency is an indication of a situation that might require changes to the design and/or this CQC.

## ***4.5 Surveying***

Documentation of the as-built locations of armor cap placement and structures will be required and will be performed by a registered professional surveyor. The surveyor will be required to provide copies of equipment calibration data prior to initiating each survey. All surveys will be based on survey control points that have been established at the Site,

## ***4.6 Construction Quality Control Plan Document Distribution Control***

Distribution of this CQC will be controlled to ensure that all parties involved in construction are working from the same version of the Plan. Every page in the plan will include the date of the last revision and page number. In addition, USA will maintain a distribution list for the Plan. Personnel not included on the list will be required to obtain copies directly from the USA.

## ***4.7 Report Submittals***

At the completion of construction activities, the CQC Officer will be responsible for certifying and submitting the final Construction Documentation Report to the Engineer, which will include all of the documentation collected during construction of the remedy. The purpose of this report is to:

- Provide final as-built drawings and documentation;
- Document manufacturer's testing reports and QC data;
- Document all QC sample results;
- Document construction inspections;
- Document any deviations from the plans and specifications;
- Describe all problems and deficiencies and their respective corrective actions;
- Provide all daily CQC reports; and
- Certify that the final as-constructed remedy is consistent with the proposed design and specification.

## ***4.8 Records Handling (Inspection, Testing, Field Operations)***

The CQC shall be responsible for collecting the daily CQC reports, inspection documentation, material certification forms, warranty information, laboratory testing reports, and surveying reports. This documentation should be duplicated and organized into appropriate files. Copies of

all documentation should be stored in the on-site construction trailer in a fireproof cabinet for the duration of the project and in the Engineer's project files in Ocean Springs, Mississippi. Original versions of all documentation should be shipped to the Engineer's office for placement in the project record.

#### ***4.9 Document Transmittal Forms, Review of Vendor Submittals***

All documentation by USA will be assigned a unique document control number (DCN), and will be date-stamped upon receipt. The CQC Officer will provide a document transmittal form with all vendor submittals that includes:

- Date of receipt;
- Name of person or persons initiating the form;
- A list of all persons required to review the document; and
- The results of the review (approval, approval with comment, rejection with comment, etc).

All vendor information included in the final construction report will be accompanied by a transmittal form.

#### ***4.10 Temporary Equipment, Piping and Connections***

USA will provide the RPR with documentation of all temporary equipment, piping, and connections. This documentation should include:

- A detailed description of the temporary equipment, piping, or connection;
- A description of why temporary equipment is necessary;
- An estimate on the length of time that the temporary equipment will be needed; and
- A plan for the replacement of temporary equipment, piping, or connections with permanent items.

It is the CQC Officer's responsibility to review and approve all temporary equipment, piping, and connections prior to their use. Documentation of the removal and/or replacement of temporary equipment, piping, or connections will be prepared by the contractor and submitted to the RPR within ten (10) days of such actions.

#### ***4.11 Shop Testing of Equipment Records***

The CQC Officer will be responsible for collecting all shop testing records for materials and equipment received on-site from the manufacturer. This documentation will be included in the final construction documentation.

#### ***4.12 Sample Documentation and Control***

All sampling performed in accordance with the CQC must be documented and included as part of the Construction Documentation Report to be submitted at the conclusion of construction activities. All samples, regardless of their origin and destination, must be handled in accordance with the sample custody procedures defined in the QAPP.

The CQC must document the collection of all samples at the time they are collected. For each sample collected, the CQC should record the following information:

- Date and time of sample;
- Sample type;
- Approximate quantity of sample;
- Sample container;
- Preservation method, if any;
- Location where sample was collected; and
- Requested analysis.

Samples must be shipped under chain-of-custody to a laboratory that meets the requirements listed in Section 2.0 of this plan.

#### ***4.13 Site Restoration (Construction Damage)***

The RPR and CQC Officer will inspect both soil and in-water remedies as they are completed. This inspection will include, at minimum:

- Date and time of inspection;
- Date construction completed;
- Weather conditions during inspection;
- Condition of soil remedy:
  - Area graded adequate to provide drainage?
  - Any areas of soil or Geotextile exposed?
  - Standing water anywhere on cap?

- Any subsidence or sinking of cap?
- Run-off from cap free of sediment?
- Liner materials properly anchored?
- Anchor materials properly located over liner?
- Anchor material placed at planned thickness?
- Condition of in-water remedy:
  - Liner materials properly anchored?
  - Anchor materials properly located over liner?
  - Anchor material placed at planned thickness?
- All contractor laydown and storage areas adequately cleaned and reseeded or covered to prevent erosion?
- All temporary utilities removed?
- All temporary construction access areas removed?
- All temporary storm water controls removed or scheduled for removal?

USA will be required to correct any items identified during the final inspection. The inspections will be conducted throughout the construction phase and at the completion of each phase/task.

#### ***4.14 Warranty / Claims Procedures***

The RPR should notify the CQC Officer of any problems or deficiencies that are the result of a defect that is covered by a vendor warranty. It is the CQC Officer's responsibility to initiate a claim with the vendor. The RPR should provide the CQC Officer with copies of all associated documentation for the item(s) in question, including daily reports indicating when the item(s) arrived and how they were handled/stored, inspection reports, and any other documentation related to the item(s) in question. The CQC Officer must document all communications with vendors in written conversation records and include these records in the project file.

If a dispute arises with a vendor in regards to a warranty claim, the CQC Officer should notify the Engineer or Owner of the dispute and provide documentation that supports the claim.

#### ***4.16 Erosion Control***

The Environmental Protection Plan (EPP), which is a component of the Contractor Work Plan CWP addresses methods for managing storm water. The Contractor will be required to implement measures required to control storm water, including erosion and sediment control, in accordance with this EPP. The CQC will perform and document inspections during construction in accordance with the EPP and any project specific Stormwater Pollution Prevention Plan (SWPPP). Evaluation of these controls will be completed as part of routine inspections, and corrective action will be implemented as required based on these inspections.



## **5.0 CONSTRUCTION INSPECTION ACTIVITIES AND SAMPLING**

### **REQUIREMENTS**

This section addresses specific inspection and sampling requirements necessary to ensure, to a reasonable degree of certainty, that the completed facilities meet the design criteria, plans, and specifications for soil and in-water remedies (AnchorQEA, 2010). The procedures outlined in this section apply to construction for both the soil remedy and the in-water remedy.

#### ***5.1 Summary of Work***

The remedial actions are described fully in the RAWP (AnchorQEA, 2010) and are summarized below.

##### **5.1.1 Soil Remedy**

The soil remedy consists of the following elements:

- Excavation, clearing and grubbing;
- Loadout, transportation and disposal of trees and brush;
- Import and placement of fill to the in-land areas;
- Grading in-land areas to plan;
- Placement of geotextile;
- Placement of geomembrane;
- Placement of a granular cover (various sizes)

##### **5.1.2 In-water Remedy**

The in-water remedy for the Site is similar to the in-land remedy. Geotextile and granular cover in water areas at depths shallower than -2 NAVD 88 will be placed by hand and excavator from In-land access. Barges will be used to place geotextile and granular cover in water deeper than -2 NAVD 88.

#### ***5.2 Clearing and Grubbing***

This section includes the QA requirements for clearing and grubbing of in-land areas. Trees and brush will be removed by excavator and insulated against contact with the contaminated soils. Root balls will be shook free of soil or removed by chainsaw. Trees and brush will be removed

off-site to an approved landfill for disposal. During all clearing and grubbing activities, the CQC will ensure the following:

- Contact between cleared trees and brush and contaminated soils are prevented;
- Root balls are shook free of soil;
- Trees and brush are inspected for soils before leaving the contaminated area;
- All soil is removed from the cleared trees and brush before they are removed from the contaminated area;
- Vegetation with visible contamination will be tested prior to off-site disposal

### **5.3 Excavation**

This section includes the QA requirements for excavation and grading of in-land areas. During all excavation activities, the CQC will ensure the following:

- Survey control monuments and grade stakes are placed prior to the start of excavation.
- Excavation areas are properly prepared and clearly marked.
- Excavation work proceeds according to the plans and specifications and details provided below.
- Contractor maintains excavations free of water.
- Contractor maintains proper excavation protection measures, including but not limited to shoring, sloping, and/or benching, for all excavations greater than 5 feet in depth or where an inspection by a competent person indicates the potential for cave-in.
- All excavations left open overnight are clearly marked and barricaded.

#### **5.3.1 Documentation**

Once completion of clearing and grubbing has been confirmed by the CQC Officer, the grading of in-land areas will be marked and documented by a licensed surveyor. The horizontal and vertical extents will be surveyed and the total elevation of placed and graded material will be calculated based on that survey data. This procedure will be repeated during and after placement of granular material. Cross-sections will be provided to the Engineer every two days to verify material placement depths. Once placement of granular material begins, equipment mounted GPS units will be provided to record placement depths of Armor Cap Material. These calculations will be supplied to a licensed surveyor for production of cross-sections.

In-water placement of fabric and granular cover will be documented by a licensed surveyor. The same GPS equipment mounted devices will be used on the in-water placement of fabric and granular cover.

### **5.3.2 Sampling Requirements and Acceptance Criteria**

Laboratory testing is required for clean fill and granular material placed on the site, regardless of its origin. The procedures for sampling and analysis are described in the RAWP. The CQC will follow all sample collection, preservation, and chain-of-custody procedures detailed in the QAPP (Integral Consulting and AnchorQEA 2010).

USA shall not place any clean fill or granular material until the fill has been observed and accepted by the RPR.

### **5.3.3 Documentation**

The CQC will confirm the thickness of loose lifts of backfill and granular material using a measuring stick or rod during placement. The thickness of clean fill on top of the contaminated soil will be documented with survey level measurements using previously established vertical controls. A level circuit will be performed on an approximate 100-foot grid pattern within the bounds of the in-land and in-water areas, to document that grades are substantially in compliance with the soil remedy design plans and specifications.

In addition to survey measurements for elevation, measurements for horizontal location will also be performed using previously established horizontal control to document the boundaries and alignment of the clean fill placement.

### **5.3.4 Armor Cap Materials**

Armor Cap Material will be obtained from off-site sources and must meet the requirements of the plans and specifications (AnchorQEA, 2010). Select Armor Cap Material will be used in the following areas:

- Above the Geotextile (In-water);
- Above the Geomembrane (In-land)

The Armor Cap Material requirements for each of these areas are provided in the plans and specifications.

### **5.3.5 Procedures and Observations**

The CQC will inspect the Armor Cap Material to ensure that it is free of debris and organic material. USA shall provide geotechnical documentation that the fill meets the requirements to the RPR prior to staging the material on-site. The CQC will obtain approval of the RPR prior to accepting delivery of the material.

The RPR will observe placement of the Armor Cap Material and will document relevant observations to support certification of the following requirements:

- Armor Cap Material above the Geotextile and geomembrane will have a varying minimum thickness as defined in the Construction Drawings.
- Armor Cap Material will be placed without driving equipment directly on the Geotextile and Geomembrane.

### **5.3.6 Documentation**

The CQC will confirm the thickness of backfill using a measuring stick or rod during placement. The thickness of Armor Cap Material on top of the Geotextile will be documented with survey level measurements using previously established vertical controls. In addition to survey measurements for elevation, measurements for horizontal location will also be performed using previously established horizontal control to document the boundaries and alignment of the clean fill placement.

## **5.4 Geomembranes**

This section includes the QA requirements for placement of the following types of geomembranes:

- Geotextile;
- Low-density Polyethylene (LLDPE);

The soil and in-water remedy includes installation of a geotextile and geomembrane (in-land) cover over the contaminated soils. This is to be covered with a minimum of 12 to 24 inches of processed and natural stone anchor material of various sizes as outlined in the plans and specifications. .

This section discusses the QC procedures to be followed for installation of all geomembranes.

### **5.4.1 Procedures and Observations**

#### **Manufacture, Handling and Storage**

The Contractor shall supply documentation from the manufacturer that demonstrates compliance with the requirements outlined in the specifications. The manufacturer should mark each roll with the following information prior to shipment:

- Name of manufacturer;
- Product type and identification number;
- Roll length and width;
- Batch or lot number;
- Nominal product thickness;
- Date of manufacture; and
- Roll (or field panel) number.

The RPR and USA will compare the information on each roll with the documentation provided by the manufacturer to ensure that the delivered material meets the requirements of the specifications.

The rolls of materials will be stored on site in an area designated by the CQC and will be protected from moisture and long-term ultraviolet exposure prior to installation. USA will provide equipment for unloading and transporting the rolls on-site. Such equipment must be capable of moving the rolls without causing damage. Preferred methods include the use of a spreader-bar, straps and a loader. Geomembrane rolls shall not be dragged. The CQC will be responsible for observing and documenting that the Contractor utilizes adequate and appropriate handling equipment and procedures.

### **Placement**

The Contractor will submit a panel layout plan, showing details of the proposed location and orientation of all geomembrane panels within each area. The Geotextile will be placed on the contaminated soil layer, as shown in the soil remedy design drawings. The panels will be overlapped so that the panel on top is oriented downhill, in a “shingle” fashion, with a minimum of 12 inches of overlap in all directions.

The CQC will document the actual roll number and seam locations on the layout drawing as installation proceeds. If all panels are placed prior to seaming, seams may be tack-welded or sandbagged to prevent shifting and maintain proper overlap prior to final seaming, and care should be taken to facilitate drainage in the event of precipitation. The Contractor shall take the following precautions during installation:

- Geomembrane is not damaged by handling, excessive heat, leakage of hydrocarbons, or other means.
- Personnel working on the geomembrane do not smoke, wear damaging clothing, or engage in other activities that could damage the geomembrane.
- Method used to unroll the geomembrane does not cause scratches or crimps in the geomembrane, and does not damage the underlying soil or geotextile.
- Method used to place the rolls minimizes wrinkles (especially differential wrinkles between adjacent panels).
- Adequate temporary loading or anchoring (continuously placed, if necessary), which will not damage the geomembrane, is placed to prevent uplift by wind.
- Direct contact with the geomembrane is minimized.

The CQC will observe and document the conditions prior to and during placement of geomembranes, the locations of each installed roll, and the condition of the installed panels.

### **Seaming**

Geomembranes: The Contractor shall submit a seaming plan with the panel layout plan for each area. The CQC Officer will review the seaming plan to ensure that the number of seams required is minimized. All personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests for the type of seaming equipment to be used. At least one seamer shall have experience seaming a minimum of 1,000,000 square feet of LLDPE geomembrane and a minimum of 2,000,000 square feet of Geotextile using the same type of seaming apparatus to be used at the Site. The most experienced seamer will have direct supervisory responsibility over less experienced seamers. The Contractor shall provide a list of proposed seaming personnel and their experience records to the RPR for review and approval prior to start of seaming.

- The welding apparatus will be equipped to continuously monitor temperature at the nozzle.
- One spare operable seaming device will be maintained on-site at all times.
- Equipment used for seaming shall not damage the geomembrane.
- The extruder shall be cleaned and purged prior to beginning seaming, and at any time that seaming operations are stopped, until all heat-degraded extrudate has been removed from the barrel.
- The electric generator for the equipment shall be placed on a smooth base in such a way that no damage occurs to the geomembrane. Similarly, a smooth insulating plate or fabric shall be placed beneath the hot equipment after usage.
- Grinding geomembrane surfaces for welding preparation shall not be performed more than one hour prior to seaming.

USA, and if applicable, the geomembrane installer/manufacturer will provide documentation to the CQC Officer regarding the quality of the extrudate used in the welding apparatus. At a minimum, the extrudate should be compatible with the base liner material and contain the same grade and quality of polyethylene resin as used in the base material.

The Contractor will keep records for each seamer performing extrusion weld seaming, including welding machine ID number, extrudate, ambient air, and geomembrane surface temperatures.

This data will be recorded at intervals as agreed to and documented at the pre-construction meeting.

Seaming may be performed under the following weather conditions:

- Unless otherwise authorized in writing by the CQC Officer, no seaming will be attempted or performed at an ambient temperature below 32°F (0°C) or above 104°F (40°C).

- Between ambient temperatures of 32°F (0°C) and 50°F (10°C), seaming will be performed only if the geomembrane is preheated by either the sun or a hot air device, provided there is no excessive ambient cooling resulting from high winds.
- Above 50°F (10°C), no preheating of the geomembrane is required.
- Geomembrane will be dry and protected from the wind.
- Seaming will not be performed during any precipitation event unless the Contractor erects satisfactory shelter to protect the geomembrane areas for seaming from water and/or moisture.
- Seaming will not be performed in areas where ponded water has collected below the surface of the geomembrane.

If the Contractor wishes to use methods that may allow seaming at ambient temperatures below 32°F or above 104°F, the Contractor shall demonstrate and certify that the methods and techniques used to perform the seaming produce seams that are equivalent to seams produced at temperatures above 50°F and below 104°F and that the overall quality of the geomembrane is not adversely affected.

Following completion of seaming, the Contractor shall conduct nondestructive testing of all seams, using a vacuum-box test utilizing the following components:

- A five-sided vacuum box with an open bottom, a clear viewing panel on top, and a pliable gasket attached to the bottom;
- A steel vacuum tank and pump assembly equipped with a pressure controller and pipe connections capable of achieving a vacuum of 26 inches of mercury (Hg) (or approximately 2 psia);
- A vacuum gauge on the tank with an operating range of 0 to 26 inches of vacuum; and
- A vacuum gauge on the vacuum box with an operating range from 0 to 10 inches of vacuum.

**Geotextiles:** Geotextiles will either be seamed either using stitching or have a minimum three (3) foot overlap. Sewn seams shall be made using polymeric thread with chemical resistance equal to or exceeding that of the geotextile. All sewn seams shall be continuous. Seams shall be oriented down slopes perpendicular to grading contours unless otherwise specified. For heat seaming, fusion welding techniques recommended by the manufacturer shall be used.

### **Defects and Repairs**

All seam and non-seam areas of the geomembranes and geotextiles will be examined and documented by the CQC for identification of defects, holes, blisters, undispersed raw materials, and any sign of contamination by any foreign matter. Because light reflected by geomembrane helps to detect defects, the surfaces will be clean at the time of the inspection. If necessary, the Subcontractor shall sweep or wash the surface to remove dust or mud prior to the inspection.



Each suspect area will be nondestructively tested using the vacuum box test method described above. Each location that fails the nondestructive test will be marked by the CQC and repaired by the Subcontractor. Acceptable repair procedures include:

- Patching – Used to repair large holes, tears, undispersed raw materials, and contamination by foreign matter.
- Grinding and Rewelding – Used to repair small sections of extruded seams.
- Spot Welding or Seaming – Used to repair small tears, pinholes, or other minor, localized flaws.
- Capping – Used to repair large lengths of failed seams.
- Topping – Used to repair areas of inadequate seams, which have an exposed edge.

Others repair procedures may be used at the recommendation of the Subcontractor if agreed upon by the CQC Officer, RPR, and USA. At a minimum, the following provisions will be met:

- Patches or caps will extend at least 6 inches beyond the edge of the defect, and all corners of patches will be rounded with a radius of at least 3 inches.
- The geomembrane below large caps should be appropriately cut to avoid water or gas collection between the two (2) sheets.

Each repair will be numbered and logged by the CQC. Each repair will be nondestructively tested following the vacuum box test procedure described above. Repairs that pass the nondestructive testing will be considered to be adequately repaired. Failed tests indicate that the repair was inadequate and will be redone and retested until a passing result is obtained. The CQC will document that all repairs have been subjected to nondestructive testing and will record the number of each repair, the date, and the test outcome.

### **Anchor Trenches**

The anchor trenches will be excavated by USA. The trenches will use a “J” configuration. No more than the amount of trench required for the LLDPE to be anchored in one day will be excavated. Anchor trenches will be backfilled and compacted by the Contractor. Care will be taken when backfilling to prevent any damage to the LLDPE. Anchor trenches will be adequately drained to prevent ponding or softening of the adjacent soils while the trench is open. The CQC will observe all trenching and backfilling operations and advise the RPR of the progress and any problems encountered.

## **5.6.2 Sampling Requirements and Acceptance Criteria**

### **Material Delivery**

USA shall not accept delivery of any materials at the Site until the CQC Officer has reviewed the manufacturer information submitted by the Subcontractor and certified that the material will meet the requirements of the specifications. The CQC will observe the material delivered to the



Site and compare the information on each roll to the information provided by the manufacturer. Any discrepancies will be noted and corrected prior to installation. The Subcontractor shall not proceed with installation until the CQC and RPR has accepted the material.

### **Seam Testing**

Prior to seaming, the Sub-contractor shall perform trial seams for each type of geomembrane to be seamed. Trial seaming will not be required for stitched seams of the non-woven geotextile. The trial seams shall be performed on a piece of material at least 3 feet long by 1 foot wide. Samples of the trial seams will be taken from each end of the trial seam. The samples will be 1-inch wide and shall be tested in shear and peel using a field tensiometer. If the seam fails in either shear or peel, the entire test will be repeated using two additional specimens cut from each end of the trial seam samples. If the second test of specimens also fails, the seaming apparatus and seamer will not be accepted and will not be used for seaming until the deficiencies are corrected and two consecutive successful trial seams are achieved. The CQC will label each trial seam sample with a unique number, the identification of the welding apparatus, the date and the seamer name. The sample will be labeled as to whether it passed or failed the field tests and stored on-site.

Seams will be tested nondestructively as described in Section 5.6.1.3. The CQC will observe all tests and submit documentation to the RPR for certification. Destructive testing will be performed at a rate of one test location for every 1,500 feet of seam length throughout the installation. Samples for destructive testing will be cut under the direction of the CQC as the seaming progresses. Holes cut into geomembranes to obtain samples for destructive testing will be immediately repaired by the Subcontractor following the procedures for repairs described in Section 5.6.1.4. The samples for destructive testing will be 42 inches long by 12 inches wide, with the seam centered lengthwise.

Destructive tests will include the following:

- Five 1-inch wide specimens will be tested in shear and five 1-inch wide specimens will be tested in peel.
- Samples will be cut in an alternating order (e.g., shear and peel, peel and shear) and will be tested in the order of cutting to determine if any trend in seam quality along the length of the sample exists.

Shear tests will measure the following values:

- Maximum tension (maximum load per unit width);
- Elongation at break (extension at break expressed as a percentage of the initial distance between the edge of the fused track and the nearer grip) up to a maximum of 100; and
- Locus of failure.

Peel tests will measure the following values:

- Maximum tension (maximum load per unit width);
- Seam separation (expressed as percent of original seam area); and
- Locus of failure.

For each set of five (5) specimens, the mean and standard deviation will be calculated and reported for the shear maximum tension and peel maximum tension. Acceptance criteria for the destructive testing are:

- Peel Adhesion (ASTM D413): > 10 pounds.
- Bonded Seam Strength (ASTM D3083): > 18.4 psi.

In the event that the criteria are not met, the Contractor has two options to determine the repair boundary:

1. The seam can be reconstructed between any two previously tested and passed destructive seam test locations.
2. The Contractor can trace the welding path to an intermediate location (at a 10-foot minimum from the point of the failed test in each direction) and request that field tests be performed at these intermediate locations. If the field sample results are acceptable, then the seam may be deconstructed between these intermediate locations. If either sample fails, then the process may be repeated until acceptable destructive seam tests have been performed in both directions away from the original failed sample location. All retesting of seams, according to this procedure, will use the sampling methodology described above.

For seams reconstructed due to a failing destructive seam sample that are greater than 50 feet long, an additional sample will be taken from the reconstructed zone must pass destructive seam testing.

The CQC will observe and document all seam tests and provide the results to the RPR. USA shall not place any material on top of the geomembranes until the RPR has approved the placement and seam testing results.

### **5.6.3 Documentation**

The CQC will be responsible for documenting all material deliveries to the Site and all nondestructive and destructive seam testing. The CQC will be responsible for communicating progress of installation and the results of seam testing to the RPR. The CQC Officer will be responsible for reviewing all sample test results and providing final approval of the seam test results.

## **5.7 Other Activities**

### **5.7.1 Site Restoration**

Upon completion of construction activities, USA will be responsible for restoring the Site to original condition per plans and specifications. This will include, at minimum:

- Removal of temporary supports, piping and equipment;
- Removal of temporary access roads;
- Removal of temporary construction facilities;
- Removal of debris and excess material; and
- Final grading.

The CQC will document all Site restoration activities, especially the final condition of the Site (i.e., Final inspection) per the plans and specifications.

### **5.7.2 Debris Disposal**

USA will be responsible for removing all debris and excess materials in accordance with the plans and specifications. The CQC will document the amount and final disposition of all construction-related debris, including the date and time it is removed from the Site, the name of the transporter, and the disposal location. The CQC will also maintain copies of analytical data, waste manifests, or disposal tickets for inclusion in the final construction report.

USA shall notify the RPR if any materials must be disposed as special or hazardous waste prior to their disposal, and shall only dispose of such wastes with pre-approval from the Owner and the Engineer and in accordance with all federal, state, and local regulations.

### **5.7.3 Final Submittals**

USA will provide the RPR with a final construction submittal within 30 days of the completion of construction activities. This final submittal must include, at minimum:

- Copies of all testing performed by outside contractors;
- Documentation of tests and activities;
- As-built drawings or information, which will allow the Engineer to prepare as-built drawings;
- Final take-off quantities;
- Summaries of materials disposed off-site; and
- Any operations and maintenance data or procedures developed during construction.

The RPR and CQC Officer will review this submittal and request additional information or clarification before including the information in the final construction report.

## 6.0 REFERENCES

AnchorQEA, LLC. November 2010. Removal Action Work Plan for the San Jacinto Waste Pits Superfund Site. AnchorQEA, Ocean Springs, Mississippi.

Integral Consulting and AnchorQEA, LLC, April 2010. Draft Final Sampling and Analysis Plan: Sediment Study San Jacinto River Waste Pits Superfund Site.

United States Environmental Protection Agency. October 1992. Construction Quality Management for Remedial Action and Remedial Design Waste Containment Systems (RREL), EPA/540/R-92/073.

United States Environmental Protection Agency. April 2010 Administrative Order of Consent (AOC). San Jacinto Waste Pits Superfund Site.